Appl. No.

: 10/623,482

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AMENDMENTS TO THE CLAIMS

Please amend Claims 1 and 38.

1. (Currently Amended) A method of forming a silicon-containing compound layer in an integrated circuit, the method comprising:

performing a plurality of deposition cycles, each cycle comprising:

depositing a silicon layer on a substrate in a process chamber by exposing the substrate to trisilane, wherein the silicon layer is;

substantially removing the trisilane from the process chamber;

forming a silicon-containing compound layer by exposing the <u>about 3-25</u>

<u>Å thick</u> silicon layer to a reactive species, <u>wherein the silicon-containing</u>

<u>compound layer has a thickness non-uniformity of about 10% or less;</u> and

substantially removing the reactive species from the process chamber.

- 2. (Original) The method of Claim 1, wherein the reaction chamber is a single substrate laminar flow reaction chamber.
 - 3. (Cancelled).
- 4. (Original) The method of Claim 1, wherein depositing a silicon layer comprises chemical vapor deposition.
- 5. (Original) The method of Claim 1, wherein depositing the silicon layer comprises forming more than one atomic layer of silicon.
- 6. (Original) The method of Claim 1, wherein the reactive species comprises a nitrogen species and the silicon-containing compound layer comprises silicon nitride.
- 7. (Original) The method of Claim 6, wherein the nitrogen species comprises ammonia.
- 8. (Original) The method of Claim 6, wherein the nitrogen species comprises nitrogen active species.
- 9. (Original) The method of Claim 6, wherein the silicon nitride layer is more uniform than a silicon nitride layer of substantially similar thickness deposited by chemical vapor deposition with silane.
- 10. (Original) The method of Claim 6, wherein the silicon nitride layer is formed over an interfacial layer.

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11. (Original) The method of Claim 10, wherein the interfacial layer comprises silicon oxynitride.

- 12. (Original) The method of Claim 10, wherein the interfacial layer comprises silicon oxide.
 - 13. (Canceled).
- 14. (Original) The method of Claim 10, wherein the interfacial layer is formed by a process comprising:

depositing a silicon layer on a substrate by exposing the substrate to trisilane; and forming the interfacial layer by exposing the silicon layer to an oxygen species.

- 15. (Original) The method of Claim 14, wherein the oxygen species comprises one or more oxidants selected from the group consisting of atomic oxygen, water, ozone, oxygen, nitric oxide, and nitrous oxide.
- 16. (Original) The method of Claim 1, wherein the silicon-containing compound layer is formed over a hydrogen passivated substrate.
- 17. (Original) The method of Claim 1, wherein substantially removing the trisilane comprises a removal process chosen from the group consisting of evacuating the process chamber and purging the process chamber with inert gas.
- 18. (Original) The method of Claim 1, wherein substantially removing the reactive species comprises a removal process chosen from the group consisting of evacuating the reactive species and purging the process chamber with inert gas.
- 19. (Original) The method of Claim 1, wherein the cycles are repeated until the silicon-containing compound layer has a thickness between about 3 Å and 5000 Å.
- 20. (Original) The method of Claim 19, wherein the cycles are repeated until the thickness is between about 3 Å and 400 Å.
- 21. (Original) The method of Claim 1, wherein the silicon-containing compound layer has a thickness non-uniformity of about 5% or less.
- 22. (Original) The method of Claim 21, wherein the silicon-containing compound layer has a step coverage of about 80% or greater.
 - 23- 37. (Canceled)

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38. (Currently Amended) A method of forming a layer, of an insulating silicon compound, having a desired thickness for an integrated circuit, comprising:

[[by]]performing multiple chemical vapor deposition cycles in a reaction chamber, each cycle comprising:

first, depositing a silicon layer on a substrate by exposing the substrate to a silicon source, wherein the silicon layer has a silicon layer thickness between about 3 Å and 25 Å, wherein depositing the silicon layer is performed under mass transport limited deposition conditions; and

second, reacting the silicon layer to partially form the layer of an insulating silicon compound, wherein trisilane is the silicon source used to deposit a first silicon layer on the substrate in a first performance of a cycle of the plurality of cycles.

- 39. (Original) The method of Claim 38, wherein reacting comprises nitriding and wherein the insulating silicon compound is silicon nitride.
- 40. (Original) The method of Claim 39, wherein the layer of an insulating silicon compound has a stoichiometry of about 43 silicon atoms per 56 nitrogen atoms.
- 41. (Original) The method of Claim 38, wherein reacting comprises oxidizing and wherein the insulating silicon compound is silicon oxide.
 - 42. (Cancelled).
- 43. (Original) The method of Claim 42, wherein the silicon source for depositing subsequent silicon layers after depositing the first silicon layer comprises a silicon compound selected from the group consisting of silanes having a silane chemical formula Si_nH_{2n+2} , where n = 1 to 4, and halosilanes having a halosilane chemical formula $R_{4-X}SiH_X$, where R = Cl, Br or I and X = 0 to 3.
- 44. (Original) The method of Claim 43, wherein all silicon layers deposited after the first silicon layer are formed with the same silicon source.
- 45. (Previously Presented) The method of Claim 105, wherein a first substrate temperature for depositing the first silicon layer is less than about 525°C.
- 46. (Original) The method of Claim 45, wherein the first substrate temperature is less than about 475°C.

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47. (Original) The method of Claim 46, wherein a second substrate temperature for reacting the first silicon layer is greater than the first substrate temperature.

- 48. (Original) The method of Claim 47, wherein depositing and reacting are performed isothermally after reacting the first silicon layer.
- 49. (Original) The method of Claim 48, wherein a third substrate temperature for depositing and reacting, after reacting the first silicon layer, is between about 400°C and 650°C.
- 50. (Original) The method of Claim 49, wherein the third substrate temperature is greater than about 525°C.
- 51. (Original) The method of Claim 47, further comprising evacuating the reaction chamber for at least about 10 seconds before reacting the first silicon layer.
- 52. (Original) The method of Claim 47, wherein the first silicon layer has a first silicon layer thickness of about 8-12 Å.
- 53. (Original) The method of Claim 52, wherein a temperature and a duration for reacting are chosen to prevent reacting the substrate under the silicon layer.
- 54. (Original) The method of Claim 52, wherein reacting the silicon layer comprises exposing the silicon layer to an atomic species.
- 55. (Original) The method of Claim 54, wherein the atomic species is atomic nitrogen.
- 56. (Original) The method of Claim 38, wherein the reaction chamber is a single substrate laminar flow reaction chamber.
 - 57-104. (Cancelled).
- 105. (Previously Presented) The method of Claim 38, wherein a temperature for reacting is less than about 650°C.
- 106. (Previously Presented) The method of Claim 38, wherein a thickness of the first silicon layer on the substrate is about greater than or equal to a nitridation saturation depth.